KENAI PENINSULA CARIBOU MANAGEMENT PLAN

ALASKA DEPARTMENT OF FISH AND GAME

U.S. FOREST SERVICE

U.S. FISH AND WILDLIFE SERVICE

FINAL

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EXECUTIVE SUMMARY

Caribou were extirpated from the Kenai Peninsula by 1912 and reintroduced via transplants from the Nelchina Herd in the mid 1960's and again in the mid 1980's. The reintroductions resulted in the establishment of five herds: the Kenai Mountains Herd, Kenai Lowlands Herd, Killey River Herd, Fox River Herd and the Twin Lakes Herd. Populations are increasing or stable for all but the Kenai Lowlands Herd.

This cooperative management plan identifies the following goals and actions for meeting those goals.

GOAL 1: *To establish and maintain caribou populations at optimum levels commensurate with long-term habitat protection.*

Optimum is defined by the following measurable parameters:

a. a maximum density of 0.8-1.0 caribou/km^2
b. a minimum fall recruitment of 20-25 calves:100 cows
c. a minimum post-hunting season bull:cow ratio of 30-40:100

The Kenai Mountain Herd has a current density of approximately 0.3 caribou/km^2. The last composition survey was completed in 1992 and the herd had a bull:cow ratio of 43:100, with a fall recruitment of 24 calves:100 cows. There is some concern that the carrying capacity of this herd may be around 400 animals as there is a decline in calf to cow ratios at that population level.

The Kenai Lowlands Herd has a very low density. This herd has the largest range with distinct seasonal use. Useable habitat for this herd remains unknown.

The density of the Killey River and Fox River Herds are fast approaching the maximum density of 0.8-1.0 caribou/km^2 and may already exceed it. The Kenai Mountains, Kenai Lowlands and Twin Lakes herds are well below this figure. All but the Kenai Lowlands herd have met the minimum fall recruitment of 20-25 calves:100 cows over the past several years. The bull:cow ratio is also being met by all the herds.

Protecting the habitat from overgrazing is a concern for the two herds at the maximum density. Without expanding into new areas, the Killey River and Fox River herds could begin negatively impacting their respective habitats. It is critical for the refuge to begin monitoring vegetation on these two ranges.

GOAL 2: *Provide the opportunity for herds to expand into suitable but unoccupied range.*

The only unoccupied, yet suitable caribou range is the Caribou Hills and the benchlands south and east of the Fox River. The Caribou Hills is

the last reported location of caribou prior to extirpation. During 1986, 16 caribou were released at Caribou Lake just south of the Caribou Hills. All of the animals dispersed from the area moving to both the Killey River and Fox River areas. Snowmachine use may significantly reduce the potential for this area to support a herd on other than a seasonal basis.

GOAL 3: *Provide for consumptive and non-consumptive recreational use of caribou herds.*

The Kenai Mountains, and Killey River herds are currently the only hunted herds on the Peninsula. A future hunt is planned for the Fox River Herd which is probably close to, or has surpassed, its carrying capacity. The Twin Lakes Herd is too small to sustain a hunt for the next several years.

Due to the small size of the Kenai Lowland Herd there has been very limited hunting opportunity during 1981 through 1993. The season was closed in 1994. The Kenai Lowlands Herd provides the greatest opportunity for non-consumptive recreational use as it is easily viewed along the roads between Kenai and Soldotna during the spring, summer, and fall.

GOAL 4: *Provide for scientific research on introduced caribou herds.*

Specific graduate or Wildlife Cooperative Unit studies relating to caribou and/or their habitat may be developed and initiated in the future. Current agency budgets are committed to conducting composition counts and census; monitoring radio-collared caribou to determine home range, seasonal movements, herd interchange; and capture operations to maintain deployment of radio-collars in each herd.

INTRODUCTION

Historically, caribou (*Rangifer tarandus*) were found on the Kenai Peninsula (Porter 1893; Seton-Karr 1887; and Schiefner 1874 cited in Lutz 1960; Palmer 1938). Although reports indicate that their distribution was widespread, estimates of population size were not given. Because suitable caribou habitat is limited on the Peninsula, caribou were probably never numerous. According to Alaska Department of Fish and Game (ADF&G) and U.S. Fish and Wildlife Service (USF&WS) records, caribou antlers originating from the early 1900s have been found in only two areas on the Kenai Peninsula during the past two decades: 1) Caribou Hills and 2) Skilak-Tustumena Benchlands.

Caribou were extirpated from the Kenai by 1912 (Palmer 1938). Davis and Franzmann (1979) concluded that caribou on the Kenai Peninsula were probably exterminated by overhunting and further stated: "Although fires may have decreased the theoretical carrying capacity of caribou ranges on the Kenai, we are confident that sufficient habitat was always available for remnant populations". Market hunters hunted caribou for mining camps during the early 1900's and may have killed most of the remaining original population.

The USF&WS first considered reintroducing caribou in 1951 (1952 Narrative Report, Kenai National Wildlife Refuge). However, a reintroduction was not attempted until the mid 1960's when a decision was made by ADF&G to reintroduce caribou to the Peninsula with the objective of establishing viable herds for the purpose of hunting.

The Nelchina herd, in Game Management Unit 13 near Glennallen, was selected as the donor herd for the reintroduction. Fifteen caribou (3 males and 12 females) were released at an airstrip near Chickaloon River (N 60°42.0', W 150°11.0') in 1965. This release site was selected as a result of studies conducted in the early 1950's which suggested that the northern portion of the Kenai Mountains could support caribou. A second release of 29 caribou (3 males and 26 females) was conducted at Watson Lake near Sterling, in 1966. The second release was scheduled for the Caribou Hills; however, a mechanical failure of the transport vehicle and deteriorating condition of the animals made farther travel impossible. These two reintroductions resulted in the establishment of two caribou herds, the Kenai Mountains Herd (KMH) and the Kenai Lowlands Herd (KLH), which in 1993 numbered approximately 400 and 66 animals respectively.

Despite these successful reintroductions in 1965/66, historical caribou range in central and southern portions of the Peninsula remained unoccupied. In 1985 and 1986, ADF&G and USF&WS initiated a cooperative program to reintroduce caribou on Kenai National Wildlife Refuge (NWR) within this unoccupied range. Eighty animals from the Nelchina Herd were released at four sites. Caribou from the Nelchina Herd were selected for the donor population for two reasons: 1) caribou previously

reestablished on the Kenai Peninsula originated from this herd; and 2) a segment of the herd wintered near Glenn Highway along Lake Louise road, thus reducing capture and transportation costs. These reintroductions resulted in establishment of three new herds on the Kenai Peninsula, designated as Twin Lakes Herd (TLH), Killey River Herd (KRH) and Fox River Herd (FRH). These herds totaled 36, 282, and 58 caribou, respectively, in November 1993.

MANAGEMENT OBJECTIVES

This Management Plan is a cooperative effort between USF&WS, U.S. Forest Service (USFS), and ADF&G. While the mandates of these agencies differ to some degree, the guiding principles are essentially the same: to protect the habitats on which wildlife populations depend; to maintain viable, healthy populations of wildlife; and to provide consumptive and non-consumptive recreation. A Caribou Working Group (composed of members from each cooperating agency) established the following objectives for management of caribou herds on the Kenai Peninsula.

1. Establish and maintain caribou populations at optimum levels commensurate with long-term habitat protection.
   "Optimum" is defined by the following measurable parameters:
   a. a maximum density of 0.8-1.0 caribou/km^2
   b. a minimum fall recruitment of 20-25 calves:100 cows
   c. a minimum post-hunting season bull:cow ratio of 30-40:100

To achieve the first objective, population size estimates will be obtained and compared with current range use. Fall population size estimates for all herds have been determined and will be continued in the future. Telemetry will be used to locate groups of animals for censusing and determining distribution to calculate densities. Herd sex and age composition data will be collected during fall to obtain calf recruitment, calf to cow ratios, and bull to cow ratios. Surveys will be conducted via helicopter by experienced observers.

The effect of predators on the growth and expansion of the Kenai Peninsula's caribou herds is unknown. Predation may not be a significant limiting factor on any of the herds as population size continues to increase (with the possible exception of the Kenai Lowlands Herd). No predator control program is planned. Predator control may be reevaluated as deemed necessary.

Monitoring to assure habitat protection will require the following:

a. Identify key habitat condition indicators.
b. Identify the costs involved, including personnel, transportation, and equipment needs.

c. Plan a strategy for analysis and repeatability of monitoring habitat changes.

Range monitoring is critical for these herds. Since caribou herds on the Kenai Peninsula occupy relatively small home ranges, all potential caribou range will be evaluated. Additionally, a program of intensive habitat evaluation will be developed to determine actual carrying capacity for each herd.

A meeting will be scheduled during November 1994 between the Caribou Working Group and Dave Swanson (Soil Conservation Service, reindeer/caribou range expert) to develop a plan for monitoring caribou habitat changes and to evaluate caribou habitat information obtained during a previous study (Paez 1991).

2. Provide the opportunity for herds to expand into suitable but unoccupied range.

Radio telemetry may provide a process to document natural movement into new areas. Density figures will be adjusted as each herd expands its range. Presently the Caribou Hills and alpine area south of Fox River are suitable areas for caribou. While we support the natural expansion of herds, another more costly option may be reintroductions to unoccupied but suitable habitat.

3. Provide for consumptive and non-consumptive recreational use of caribou herds.

Caribou from the KLH are presently available for roadside viewing along Bridge Access Road as well as neighborhoods between Kenai and Soldotna. The other herds are not found in developed areas and viewing requires back country travel. Hunting is currently allowed on the KMH and the KRH, with future hunts planned for the FRH and TLH.

4. Provide for scientific research on introduced caribou herds.

Specific graduate or Wildlife Cooperative Unit studies relating to caribou and/or their habitat may be developed and initiated in the future. Current USF&WS and ADF&G budgets are committed to capture operations and monitoring radio-collared caribou to meet the first management objective.

The five caribou herds and their planned management will be discussed separately. Population goals for each herd are based on current population information, areas of present distribution and a maximum density of 0.8-1.0 caribou/km^2 of known suitable habitat.

Data from past surveys and population trends were used to set goals. These goals will be re-evaluated on an annual basis. The Caribou Working Group will meet each November or December to review data collected the previous year. Changes to the plan can be made at that time upon agreement by all parties. This agreement will remain in effect until terminated by the cooperating agencies.

KENAI MOUNTAIN HERD

Range

The KMH occupies that portion of Game Management Unit (GMU) 7 north of the Sterling Highway and west of the Seward Highway. Land ownership is primarily USFS and USF&WS. The herd ranges between elevations of approximately 2,000 to 4,500 feet. Critical winter range includes the windblown ridges of that portion of the Kenai Mountains bordered by American Pass on the south, Little Indian Creek on the north, Big Indian Creek on the west, and Resurrection Creek on the east. Caribou expand their range in summer to areas east and south of Resurrection Creek to the Seward and Sterling highways. The calving ground for the KMH extends from American Pass to the headwaters of Big Indian Creek, including the headwaters of American, Hungry and Moose creeks. Summer and winter range are shown in Figure 1. There is no known post-calving aggregation area.

Population

The KMH has had two documented population peaks in its 28 year history (Figure 2). The original introduction of 15 animals in 1965 grew to a minimum pre-hunting season population of 339 animals by 1975. The population declined sharply to 193 by 1977, primarily due to overharvest. The herd increased to another pre-hunting season peak of 434 in 1985, through more conservative hunting regulations. Herd size has fluctuated downward since that time to 305 in 1988, but has increased again to an estimated 405 animals in the spring of 1992. In 1993 the herd appeared to be stable. The 1992 herd composition was 24 calves and 43 bulls:100 cows; calves accounted for 14 percent of the total (390) observed (Table 1).

The estimated population size shown in Table 1 was determined by adding the reported harvest to the fall survey count. Calf recruitment appears to have declined in the mid to late 1980's, then increased in 1990, followed by another decline in 1992. The mean percentage of calves in the herd between 1987 and 1992 was 15. The ratio of bulls to cows has remained relatively stable from 1987 to 1992 with a mean of 41:100.

Habitat

There are approximately 1,407 km^2 (563 mi^2) within the known range of the KMH (Figure 1). Winter range is approximately 532 km^2 of the total identified range. Pitcher (ADF&G, pers. comm.) suggested that caribou densities in Alaska should not exceed 1 caribou/km^2 to maintain range quality. The non-migratory nature of the KMH may cause it to vary significantly downward from this figure. Although habitat components of this herd have not been thoroughly investigated, concerns for habitat limitations have been discussed since the mid 1980s when the herd's performance started to decline. During the period 1980-83, when the herd increased from 248 to 305 animals, the calf to cow ratio remained

Figure 1. Distribution of the Kenai Mountains Caribou Herd (KMCH).

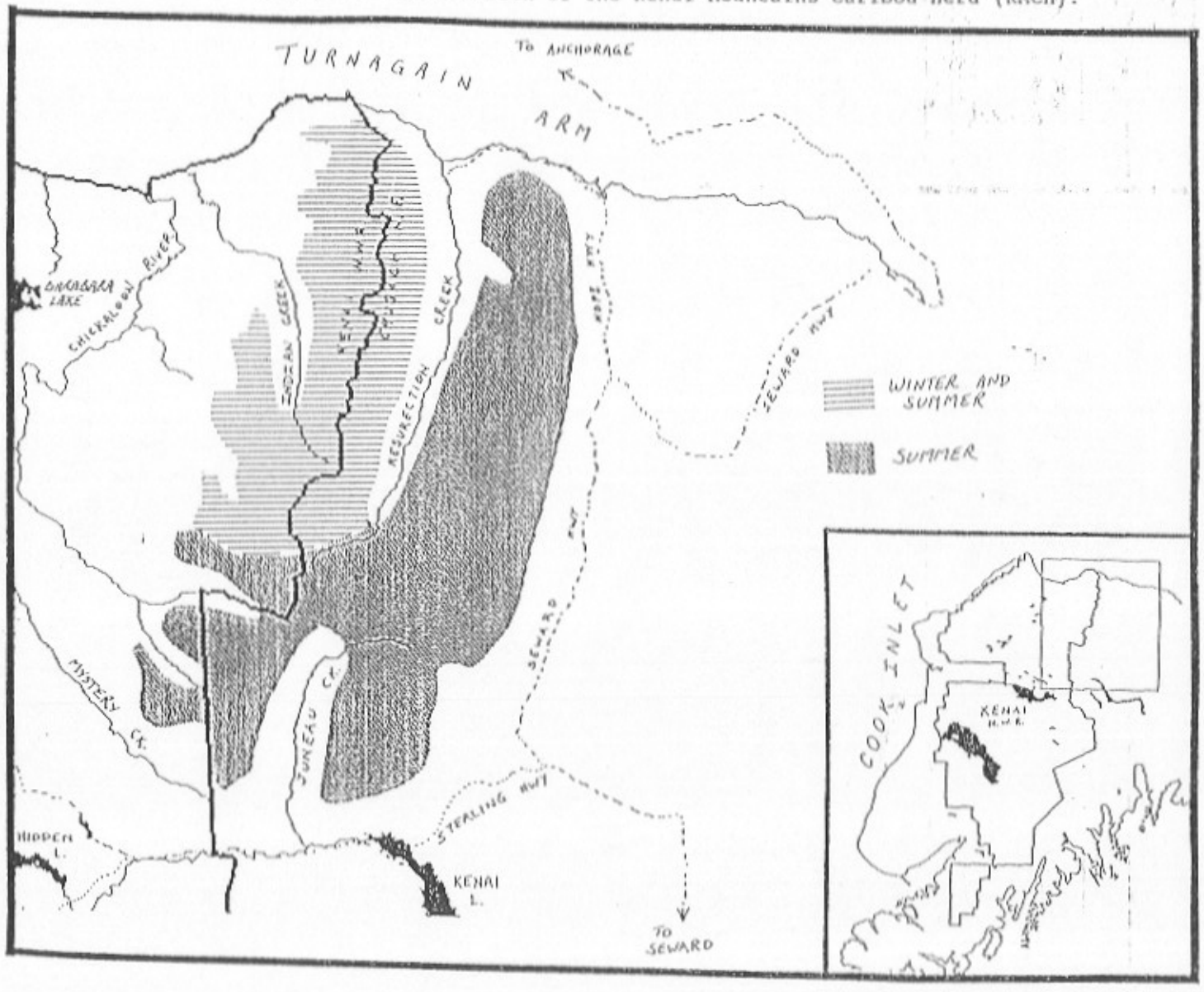


Table 1. Kenai Mountains Caribou Herd fall composition counts and estimated preseason population size, 1985-1993.

REG. YEAR	BULLS/100 COWS	CALVES/100 COWS	PERCENT CALVES	COMPOSITION SAMPLE SIZE	EST. HERD SIZE
1985/86[a]	44	25	15	401	434
1986/87	--	--	--	---	---
1987/88[b]	44	20	12	303	347
1988/89[c]	37	23	15	280	305
1989/90	--	--	--	---	---
1990/91[d]	39	34	20	303	310
1991/92	--	--	--	---	---
1992/93[e]	43	24	14	390	405
1993/94					

[a] surveyed 29 Oct 1985
[b] surveyed 20 Mar 1988
[c] surveyed 21 Oct 1988
[d] surveyed 30 Oct 1990
[e] surveyed 11 Nov 1992

steady at 43:100; however, it dropped to 25:100 when the herd peaked at 434 in 1985. Human caused mortality probably became additive as far back as 1985, accelerating the decline. The point at which calf to cow ratios declined may be an indication of carrying capacity for this herd.

Harvest

Hunting the KMH began in 1972/73, and harvest has varied from 6 to 87 animals taken per year. With the exception of three years (1974/75 to 1976/77) hunting has been by limited permit drawing. The number of permits issued has ranged from 20 to 250, with 200 issued in 1994. Table 2 lists harvest and hunting effort for 1989 to 1993.

Population Monitoring

Radio telemetry and summer/fall aerial surveys will continue to be used to assess population trends, composition, winter productivity, mortality, and habitat use patterns for the KMH. A minimum of 10 radio-collared adult female caribou should be maintained each year to facilitate location of the herd (currently there are 4 active collars). The steepness of the terrain where this herd lives makes them extremely difficult to locate on a dependable basis. Traditionally, the KMH has been located by snow tracking in late October. The use of radio telemetry should reduce monitoring flight times and increases the number of caribou found per flight. Fall surveys conducted in late October

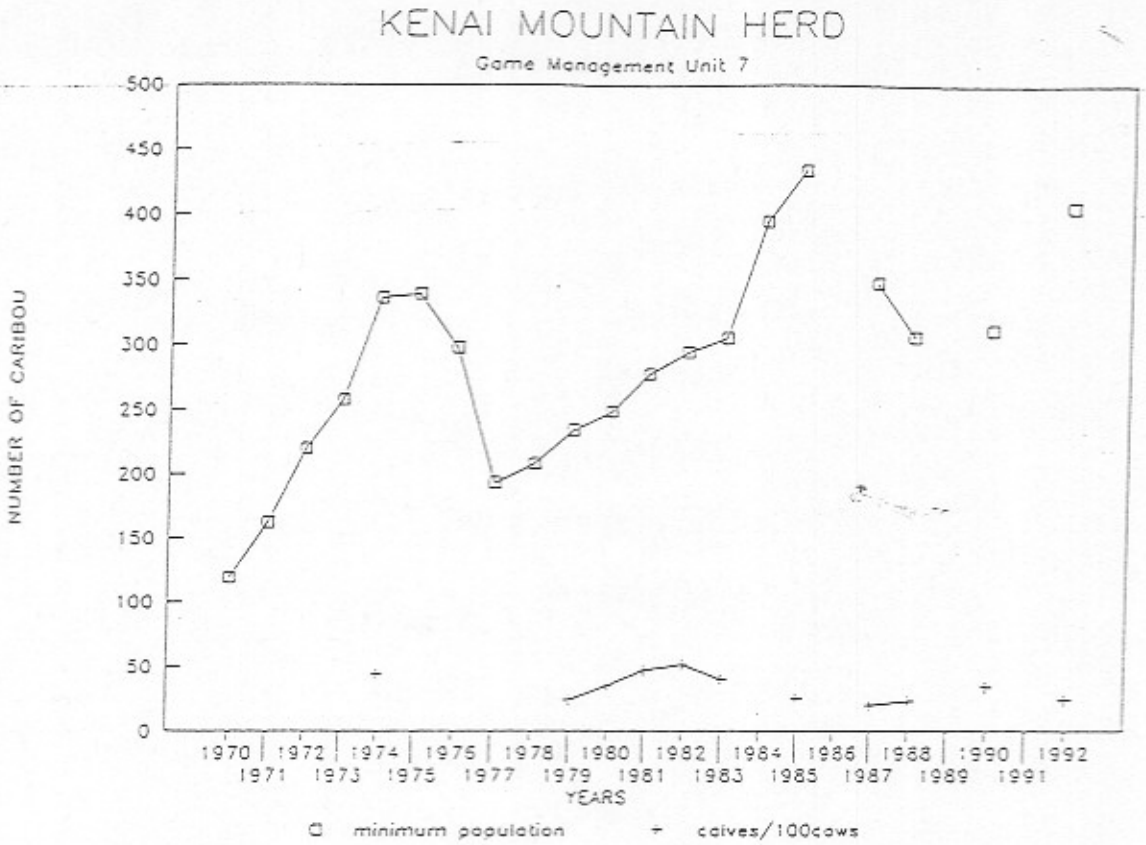


Figure 2. Historical population change for the Kenai Mountains Herd, 1970 - 1992.

will provide herd composition and size. Spring surveys will provide data pertaining to selected calving areas and time of calving. Results of a survey conducted in spring of 1988 suggests that calving occurs after the first of June; however, since time of calving is believed to be correlated to habitat quality, a more accurate assessment is needed.

KENAI LOWLANDS HERD

Range

Most members of the KLH summer in GMU 15A and 15B north of the Kenai airport and south and east of Kalifornsky Beach Road, in an area comprised of state, city of Kenai, borough, and private lands. Caribou are also located in the Swan Lake Canoe System, Moose River valley and near Beaver Lake. Although some animals have been observed in winter south and east of Kalifornsky Beach Road, most of the herd migrates east to winter on the Kenai NWR along Moose River to the outlet of Skilak Lake, occupying approximately 1,179 km^2 (472 mi^2) (Figure 3). Unlike ranges for other herds on the Peninsula, summer and winter range are separate for the KLH. The summer range is 254 km^2 (101 mi^2) compared to 925 km^2 (370 mi^2) for the winter range. Calving occurs in the wetlands

Table 2. Harvest statistics for the Kenai Mountain Herd, 1972-93.

YEAR	PERMITS ISSUED	HARVEST MALES	HARVEST FEMALES	TOTAL HARVEST
1972/73	20	6	0	6
1973/74	100	10	1	11
1974/75	?	30	14	44
1975/76	?	38	49	87
1976/77	?	22	27	49
1977/78	100	11	15	26
1978/79	100	19	11	30
1979/80	100	17	16	33
1980/81	100	13	8	21
1981/82	100	12	9	21
1982/83	150	15	12	27
1983/84	150	19	10	29
1984/85	200	34	17	52
1985/86	200	21	12	33
1986/87	250	36	14	50
1987/88	250	21	23	44
1988/89	150	15	10	25
1989/90	150	12	2	14
1990/91*	50	7	0	7
1991/92	100	9	7	16
1992/93	100	11	4	15
1993/94	200	26	7	33

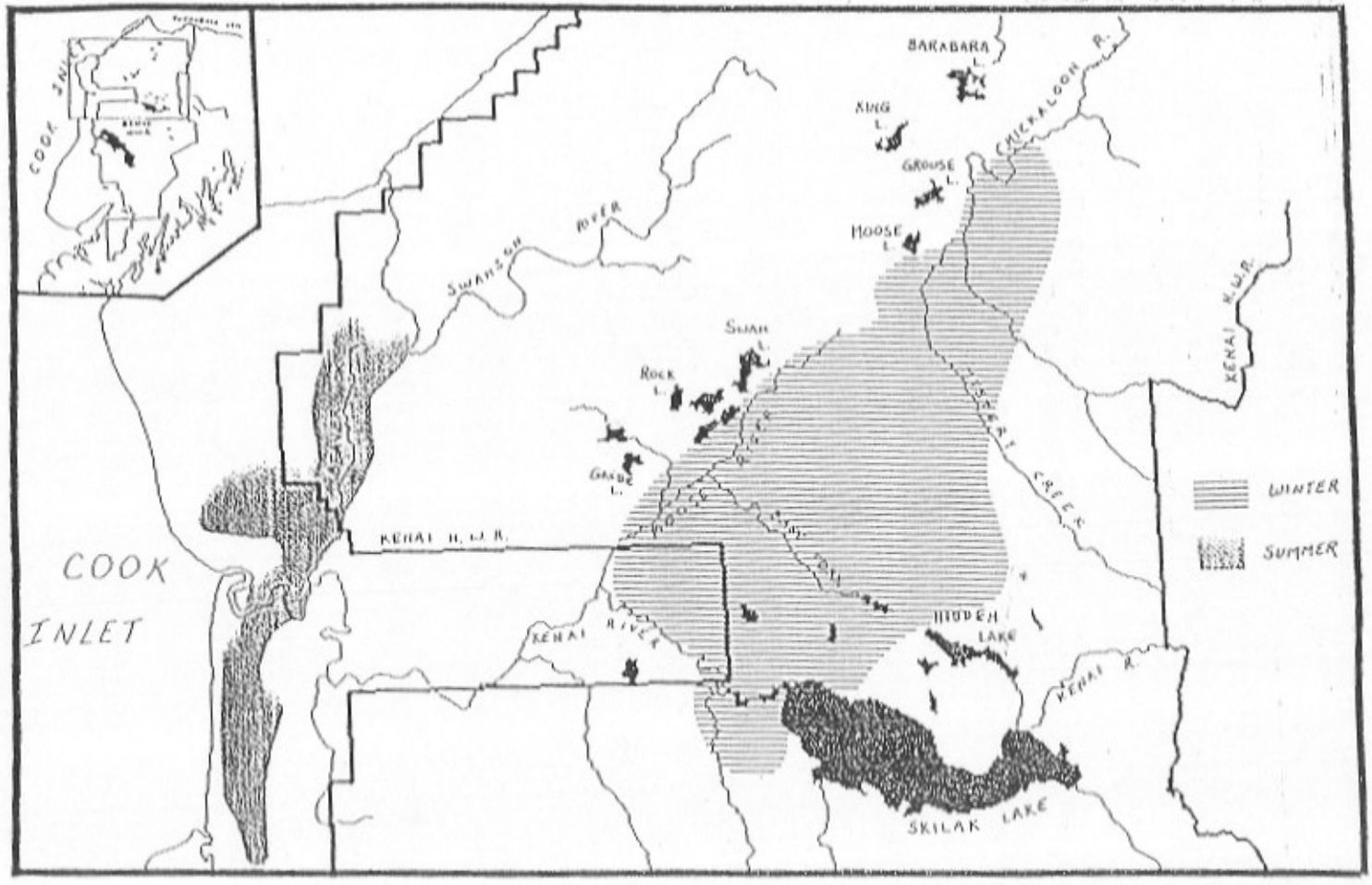
* harvest restricted to bulls only in 1990/91

north of the Kenai airport, along the Kenai River flats, and the wetlands south and east of Kalifornsky Beach Road. Calving areas are bisected by highways, and include high densities of human and industrial activity.

Population

The KLH has been surveyed only during spring due to the heavily-timbered nature of the area utilized during fall breeding aggregation. Data collected from 1987 to 1993 indicate mean June calf survival to be 18 percent of the herd, with a range of 9 to 24 percent (Table 3). Peak calving occurs during the third week of May. The KLH reached its largest size in spring of 1989, when 117 caribou were observed. The population remained stable in 1990 but then declined to 98 animals in 1991. The decline continued with a count of 74 in 1992 and 66 in 1993. Low recruitment has plagued the KLH. ADF&G collared ten calves in May 1994 to identify the source(s) of mortality for calves. Collaring calves will be continued in future years. In addition to low recruitment, there

Figure 3. Distribution of the Kenai Lowlands Caribou Herd (KLCH).



is a second reason for concern that this herd may not recover. The KLH slowly increased in numbers throughout the 1980s, but annual recruitment was not high enough to offset the aging trend in the population. In 1991 and 1992, for example, 13 randomly captured adult cow caribou were comprised of six (46%) 10+, five (39%) 6 to 9 and two (15%) 3 to 5 year old animals. If the assumptions are correct that this herd is comprised of mostly aged adults, and that recruitment will remain low, then the probability of recovering without assistance is low.

Table 3. Kenai Lowland Caribou Herd summer composition counts and estimated population size, 1987-1993.

REG. YEAR	BULLS/100 COWS	CALVES/100 COWS	PERCENT CALVES	COMPOSITION SAMPLE SIZE	EST. HERD SIZE
1987/88[a]	..	..	11	115	130
1988/89[b]	..	..	9	117	130
1989/90[c]	..	..	17	117	130
1990/91[d]	..	..	12	98	110
1991/92[e]	..	..	24	74	80
1992/93[f]	..	..	24	66	75
1993/94					

[a] surveyed 17 Jun 1988
[b] surveyed 19 Jun 1989
[c] surveyed 13 Jun 1990
[d] surveyed 25 Jun 1991
[e] surveyed 5 Jun 1992
[f] surveyed 8 Jun 1993

Ten animals have been killed in highway accidents in the past four years. Vehicle accidents may be a significant mortality factor for such a small herd. Highway kills need to be well documented to compare trends with an expected increase in traffic and speed for the Kenai-Soldotna-Sterling area. Further economic and population growth of the area will mean continued building and development on lands presently utilized by caribou.

Habitat

The area occupied by the KLH during winter is primarily spruce forest and open muskeg along the Moose River drainage. Bog-muskeg and open wetlands near the mouth of the Kenai River are utilized during summer. Total summer and winter range is approximately 1179 km^2 (472 mi^2), and the herd appears to be expanding its range. Questions have arisen concerning a declining herd expanding its range with the implication that poor quality habitat is the reason for the herd's decline and range expansion. Although range evaluations have not been conducted, the range occupied by this herd is not considered atypical

habitat for caribou. Harassment by dogs and human disturbances may be pushing these animals into new areas at the same time that their numbers are declining from low recruitment and natural attrition. A thorough evaluation of habitat types and vegetation utilized by the KLH is needed, as well as a look at the continued human development occuring within its summer range.

Harvest

The KLH was hunted (bulls only) during the years 1981, and 1988 through 1992 (Table 4). There was no open season during 1993 nor will there be in 1994 due to the population decline. Five permits were issued in 1981 and three in each subsequent year that the season was open. Four bulls were taken in 1981, two bulls and one cow in 1988, two bulls annually from 1989-1991 and one bull in 1992. The open season for both resident and non-resident hunters has been September 1-20.

Table 4. Harvest statistics for the Kenai Lowlands Herd, 1981-93.

YEAR	PERMITS ISSUED	HARVEST MALES	HARVEST FEMALES	TOTAL HARVEST
1981/82	5	4	0	4
1982/88	NO SEASON			
1988/89	3	2	1	3
1989/90	3	2	0	2
1990/91	3	2	0	2
1991/92	3	2	0	2
1992/93	3	1	0	1

Population Monitoring

The KLH has been monitored using spring aerial surveys and locations of radio-collared adult females. In April 1991 four adult females were collared to facilitate herd location during snow-free periods. Three of these females were killed by wolves during the winter of 1991/92 when snow depths were exceptionally high. The remaining female is still alive and her collar is functional. In April 1992 nine additional adult females were radio-collared. Two of these females died, one was killed by a highway vehicle in May 1992 and another was killed in September 1993 by unknown causes. We collared another 5 adult females in April 1994, bringing the total to 13 adult females collared.

Monitoring of these collared females confirmed that eight of 10 produced calves in 1992 and one calf survived until fall. In 1993, five collared females were observed with a calf at heel and three of the remaining four had distended udders, suggesting eight calves were born. Fall 1993 counts indicated only two of those calves survived the summer. Mean summer survival rate for calves born to collared females (N=16)

during these two years was 19 percent. Survival rate of adult collared females (n=13) from April 1991 to November 1993 was 62 percent, suggesting a mean annual loss of collared females of 19 percent.

A calf survival study was initiated in spring of 1994 to determine the cause(s) of calf mortality during early summer. ADF&G collared ten neonate calves and will monitor their survival during summer. Calf collars are designed to break away after 10 months, allowing their reuse in spring of 1995. So far this year 2 of 10 collared calves died in a vehicle accident.

KILLEY RIVER HERD

Range

The KRH comprises the largest group of caribou resulting from the 1985-86 reintroductions. The herd occupies approximately 371 km^2 (148 mi^2) of Kenai NWR land in GMU 15B, utilizing alpine and subalpine habitat at elevations between 2,000 and 4,500 feet on the benchlands between Skilak Lake and Tustumena Glacier (Figure 4). Presently, animals of the KRH have restricted their use to above tree line habitat. They winter on windblown ridges of the Kenai Mountains at elevations from 2,500 to 4,500 feet between the Harding Icefield and Skilak-Tustumena Benchlands. Summer range includes the above tree line elevations from 2,000 to 4,500 feet as well as all areas used during the winter. Calving in 1994 occured on higher mountain ridges (above 4,000 feet) north and south of Indian Glacier. Peak calving occured between 16 May and 26 May.

Population

By the summer of 1987, the KRH contained at least 70 animals. Assuming that most emigration had occurred by this time, the herd increased through recruitment at an average annual rate of 26 percent from 1987 to 1993 (Table 5). Calf percentages in June 1989 and 1990 were 19 and 25, respectively. Fall calf:cow and bull:cow ratios were 55:100 and 82:100 in 1990, 43:100 and 67:100 in 1992 and 44:100 and 54:100 in 1993 (ADF&G, in press). A composition survey was not conducted in 1991.

The KRH increased from 70 animals in 1987 to at least 281 animals by fall of 1993. Herd composition in fall 1993 was 79 bulls, 62 calves, and 140 unclassified adults. Calves represented 22 percent of the total observed. Density of animals in the KRH is approximately 0.8 caribou/km^2. If the mean rate of increase (26%) remains relatively constant, and assuming no emigration, the KRH could approach a density of 1.0 caribou/km^2 (354 animals) by fall of 1994.

Table 5. Killey River Caribou Herd fall composition counts and estimated population size, 1988-1993.

REG. YEAR	BULLS/100 COWS	CALVES/100 COWS	PERCENT CALVES	COMPOSITION SAMPLE SIZE	EST. HERD SIZE
1988/89[a]			19		91
1989/90[b]			25		132
1990/91[c]	82	55	23	154	154
1991/92[d]					197
1992/93[e]	67	43	20	222	222
1993/94[f]	56	44	22	281	282

[a] surveyed 27 Jun 1989
[b] surveyed 18 Jun 1990
[c] surveyed 2 Nov 1990
[d] surveyed 11 Nov 1991
[e] surveyed 11 Nov 1992
[f] surveyed 15 Nov 1993

Habitat

That portion of the Skilak-Tustumena Benchlands located south of the Killey River contains approximately 371 km^2 (148 mi^2) of potential habitat for caribou. The benchlands are primarily vegetated with alpine shrub-lichen tundra which is very sensitive to physical disturbance. Willow (*Salix sp.*) covers lower and wetter sites, while dwarf birch (*Betula nana*) occurs on upland and drier sites. Tussocks covered with willow and cranberry (*Vaccinium vitis-idea*) are common over most of the area. There are numerous areas of bare rock, and shrub subalpine habitat.

Harvest

There has been no hunting of the KRH since reintroduction in 1985-86. ADF&G has a hunt approved by the Board of Game scheduled for the fall of 1994. When hunting is initiated, the number of drawing permits will be allocated based on maintaining an annual harvest rate not exceeding 10 percent of the estimated population. With an average annual recruitment of 26 percent, a harvest of up to 10 percent would allow for continued herd growth. A greater harvest to maintain the population at current size may prevent possible overutilization of the range for this herd which may be reaching carrying capacity.

Population Monitoring

In April 1994 ADF&G and USF&WS collared 7 adult female caribou. With two older collars from 1991, there are currently 9 active transmitters. A minimum of 10 animals in the KRH should be instrumented with radio transmitters to determine herd distribution and facilitate

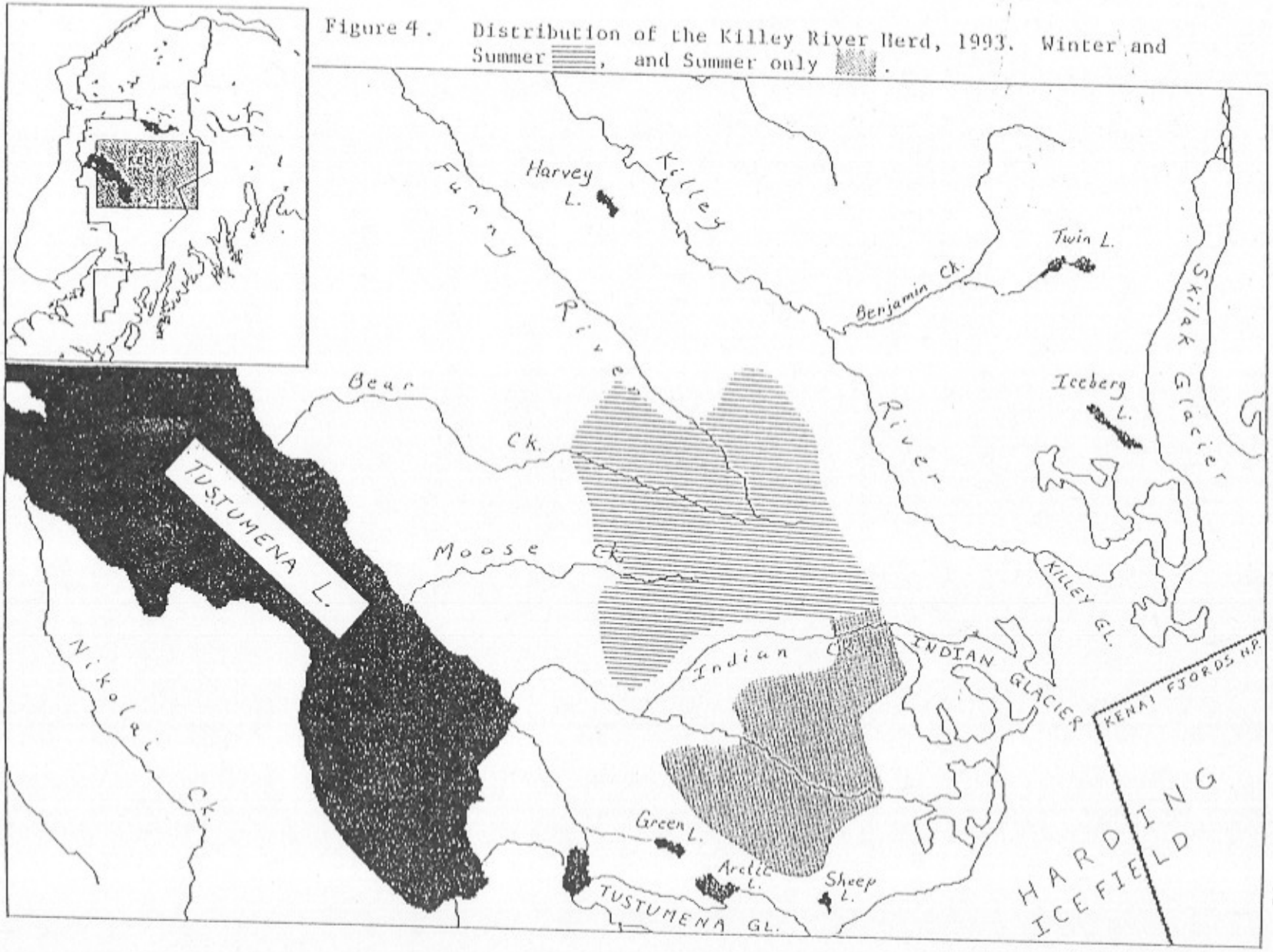


Figure 4. Distribution of the Killey River Herd, 1993. Winter and Summer, and Summer only.

monitoring. Selection of adult females for collaring will provide additional data on calving areas, calf production and survival. Monitoring should be conducted on a weekly basis from May 10 to July 15. This herd should be closely monitored as its density is the highest for any of the Peninsula's caribou herds.

TWIN LAKES HERD

Range

The TLH occupies the area drained by upper Benjamin Creek and surrounding mountains between Skilak Lake and upper Killey River, an area of approximately 216 km^2 (86 mi^2) (Figure 5). The area is characterized by subalpine and alpine plant communities and ranges in elevation from 2,000 to 4,700 feet. Distribution of this herd is not well known as only a few sightings of caribou are recorded for this area. Movement between the KRH to the southwest and the TLH is another unknown factor in the dynamics of both herds.

Population

The TLH is believed to have originated from animals emigrating from the KRH shortly after the 1986 release. In 1990, 18 caribou (14 adults and 4 calves) were located in the west fork of Benjamin Creek. In November 1993, 36 animals were observed - 23 cows, 6 calves and 7 bulls. Ratios were 26 calves and 30 bulls per 100 cows. Calves comprised 17% of the total animals observed (Table 6). Thirty-six caribou, including 8 calves were observed on 3 June 1994 during a telemetry monitoring flight. Eight calves were again counted on 6 July 1994.

Table 6. Twin Lakes Caribou Herd composition counts and estimated population size, 1990-1993.

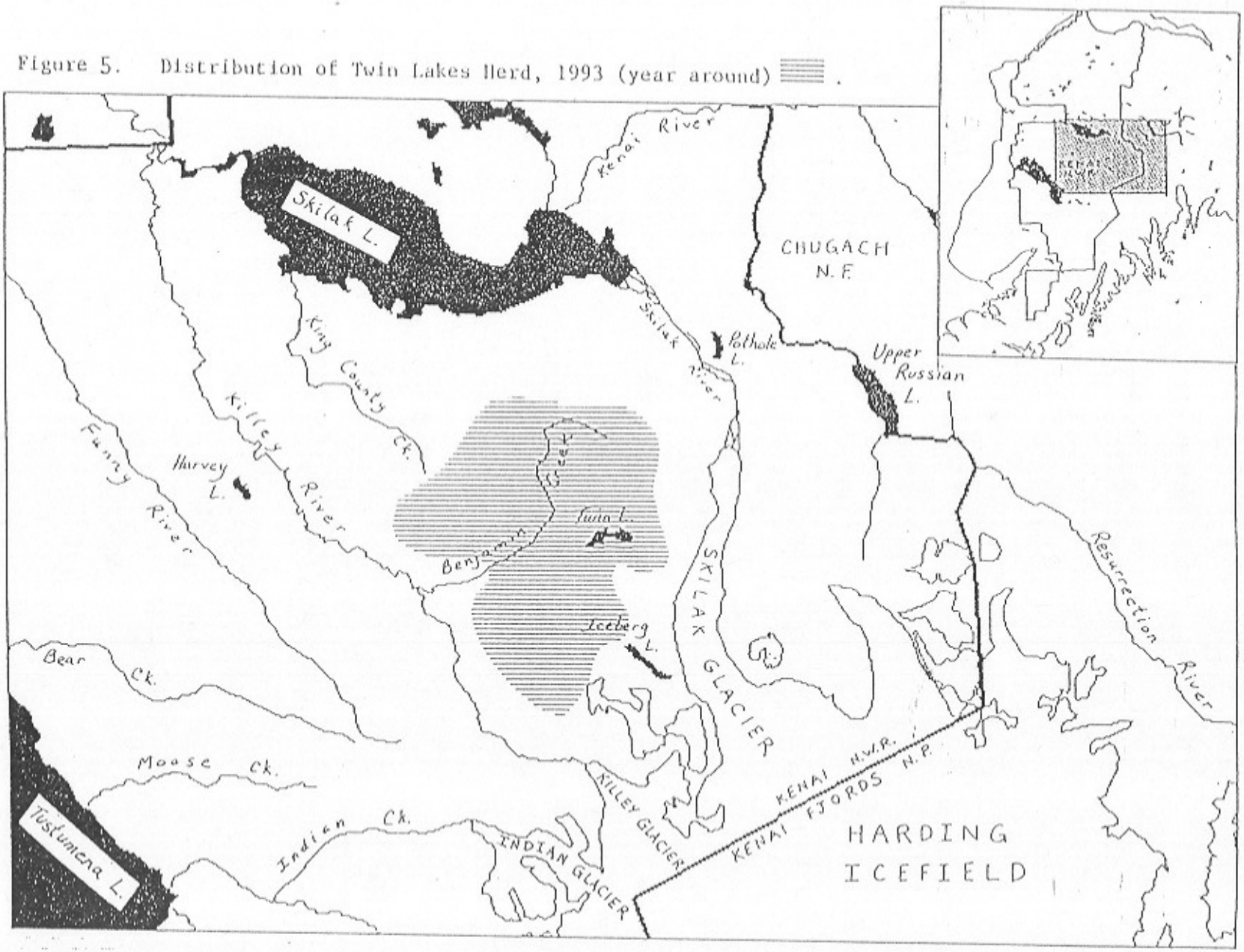
REG. YEAR	BULLS/100 COWS	CALVES/100 COWS	PERCENT CALVES	COMPOSITION SAMPLE SIZE	EST. HERD SIZE
1990/1991[a]			22	18	18
1991/1992[b]					14
1992/1993[c]					29
1993/1994[d]	30	26	17	36	36

[a] surveyed 15 Jun 1990
[b] surveyed 26 Jul 1991
[c] surveyed 30 Oct 1992
[d] surveyed 15 Nov 1993

Habitat

Habitat plots were established by Paez (1991) in Twin Lakes and Cottonwood Creek areas. Follow up monitoring needs to be done for this and other herd ranges. Density is currently estimated at 0.2

Figure 5. Distribution of Twin Lakes Herd, 1993 (year around) ▤ .



caribou/km², suggesting that this herd has the greatest potential for population growth when compared to other Peninsula herds. Assuming that the habitat can support a density of 1.0 caribou/km² the TLH could increase to approximately 200 animals. If the TLH grows at the same annual recruitment as the KRH, the population should reach 1 caribou/km² by spring 2001.

Harvest

There is currently no hunting of this herd.

Population Monitoring

A capture operation occured in April 1994 and radio-collars were deployed on four adult cows to help document calving areas, calf production and survival, herd size, and distribution.* The USF&WS located a radio-collared KRH cow with calf on both sides of the Killey River between June and July 1993. One of the newest (1994) collared cows from the KRH crossed the Killey River to the TLH, calved and remains there as of the last monitoring flight (6 July). Monitoring radio-collared cows will help in identifying the TLH as a seperate and distinct herd. Monitoring should be conducted on a weekly basis from May 10 to July 15 to document calving areas and productivity.

FOX RIVER HERD

Range

The FRH occupies alpine and subalpine habitats from Tustumena Glacier south to the Fox River (Figure 6). This area lies within GMU 15C on KNWR lands. The area contains approximately 85 km² (34 mi²) of potential caribou habitat. Winter range is limited to approximately 56 km² of the total range. The FRH originated from a release of 16 caribou near Caribou Lake, located south of the Caribou Hills, in April 1986. The animals abandoned the release area by October 1986 and moved into the Kenai Mountains to the northeast. The FRH currently utilizes windblown slopes of the Kenai Mountains during the winter, while summer range includes the lower elevations of the Truuli Creek drainage at elevations from 2,000 to 4,000 feet. Telemetry flights in May and June documented calving along the high mountain ridge (near 5,000 feet) between Truuli and Chernof glaciers and the ridge north of Truuli Glacier.

Population

By 1987, the FRH numbered at least 22 caribou. The herd increased at a rate of 19 percent annually from 1987-1993, excluding one year of zero growth. Fall 1993 survey results indicate that this herd numbers at least 58 caribou (Table 7). Current density is 0.7 caribou/km². Assuming annual recruitment will continue at the current mean rate, FRH density will be 1.0 caribou/km² (82 animals) by fall 1995. Productivity and calf survival in the FRH appears moderately high, ranging from 28

Figure 6. Fox River Herd distribution, Summer only ▒, Winter/Summer ≡.

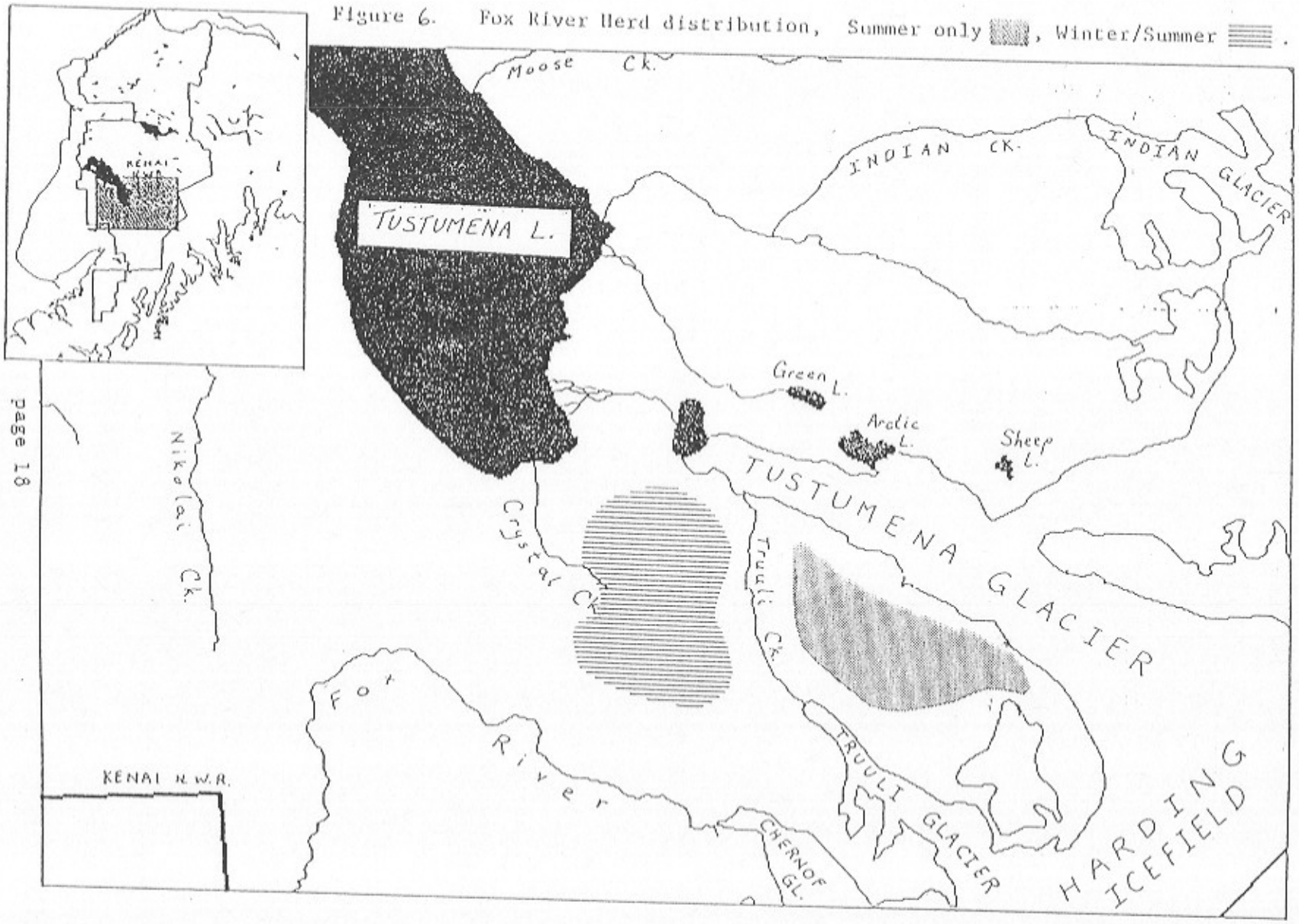


Table 7. Fox River Caribou Herd summer composition counts and estimated population size, 1987-1993.

REG. YEAR	BULLS/100 COWS	CALVES/100 COWS	PERCENT CALVES	COMPOSITION SAMPLE SIZE	EST. HERD SIZE
1987/88					22
1988/89[a]	64	64	28	32	32
1989/90[b]			44	23	37
1990/91[c]			27		37
1991/92[d]					40
1992/93[e]			30	61	61
1992/93[f]	74	44	20	50	50
1993/94[g]	61	23	12	57	58

[a] surveyed 27 Jun 1989
[b] surveyed 18 Jun 1990
[c] surveyed 2 Nov 1990
[d] surveyed 11 Nov 1991
[e] surveyed 23 Jun 1992
[f] surveyed 11 Nov 1992
[g] surveyed 15 Nov 1993

percent in 1989 to 44 percent in 1990, the only years that spring surveys were completed. Fall surveys in 1990, 1992, and 1993 revealed that the herd was comprised of 27, 20, and 12 percent calves, respectively.

Habitat

Truuli Creek Plateau is primarily alpine shurb-lichen tundra. Areas between 1,000 and 2,000 feet contain lowland subalpine shrub habitat and elevations below 1,000 feet contain mature spruce forest. Vegetation is sparse above 4,000 feet and the east end of the plateau extends to Harding Icefield. Common plants on the plateau include: crowberry (*Empetrum nigrum*), dwarf birch, willow, and dryas (*Dryas octopetala*) (Paez 1991). Lichen component is chiefly *Stereocaulon* spp., *Cladonia* spp., and *Cetraria* spp.

There is approximately 50km^2 of additional suitable habitat on the benchlands south of Fox River, as well as 70km^2 in the Caribou Hills to the west of Truuli Creek Plateau. Both areas are currently unoccupied by caribou.

Harvest

No hunting has been allowed on the FRH to date. A limited harvest may be necessary by fall 1995 to maintain the population density near 1.0 caribou/km^2. Harvest and hunting effort data will provide information pertaining to hunters' ability to access the area and harvest animals. Since access into areas occupied by the FRH is

difficult, several years of assessing hunter effort and success may be necessary to determine the number of permits required to properly manage annual harvest.

Population Monitoring

Radio telemetry will continue to be used for monitoring the FRH population. There are 4-active collars on this herd. A capture operation in April 1994 deployed 3 additional collars on adult females. One collar is still functioning from a 1991 capture. This will provide a minimum of 4 collared animals for collecting information on population trends, composition, productivity, and seasonal distribution as well as identification of specific calving areas and time of calving.

SUMMARY

This plan establishes criteria to maintain viable and healthy herds of caribou on the Kenai Peninsula. Four management objectives are presented. Caribou herds will be managed based on the following criteria: a maximum density of 0.8-1.0 caribou/km^2, a minimum fall recruitment of 20-25 calves:100 cows, and a minimum post season bull:cow ratio of 30-40:100.

Caribou range expansion into suitable but unoccupied habitats in the Caribou Hills and alpine tundra south of Fox River is desirable. Due to the expense of introducing animals, we favor natural expansion of existing herds into new areas to achieve this objective.

Protection of habitat is a primary responsibility for land managers - USF&WS and USFS. Monitoring habitat on five caribou ranges is needed. Some intensive work has been done (Paez 1991) but repeatability of past monitoring needs to be simplified and standardized as funding may be difficult to obtain. The Soil Conservation Service has been requested to assist in developing a habitat monitoring program.

Radio telemetry will continue to be used to locate animals to document seasonal distribution; estimate population size, productivity, and survival rates; and delineate calving grounds. Tracking radio-collared caribou should be done frequently during calving to assess calf survival and at least monthly during the rest of the year to maintain contact with the herd's activities. Documenting peak calving period and recruitment may provide insight into overall health of the herds. It will be critical to maintain a sufficient number of radio-collars on each herd to achieve this objective.

USF&WS will be using the form in Appendix I to record data from telemetry flights. Refuge aircraft are equiped with Global Positioning Systems for collecting Universal Transverse Mercator(UTM) coordinates. These coordinates are entered directly into a dBASE IV file and mapped using Simple Geographic Language (SGL). The refuge will be utilizing PC ARC for future computer mapping.

WORK PLAN:

NOV 94	Composition counts (via helicopter) and census each herd. Conduct one telemetry flight for each herd. Possible meeting with Soil Conservation Service to plan the development of a habitat monitoring program.
DEC 94	Meeting of the Caribou Working Group.
JAN-APR 95	Conduct telemetry flights monthly on each herd.
MAY-JUN 95	Calving surveys.

JUL 95* Vegetation surveys for habitat monitoring.
JUL-OCT 95 Conduct telemetry flights monthly on each herd.
NOV 95 Composition counts and census each herd.
DEC 95 Meeting of the Caribou Working Group.

* Need to determine the frequency (every year, two years, or three years) of vegetation monitoring in consultation with Soil Conservation Service and the Caribou Working Group.

SIGNATURES

By their signatures below, the undersigned hereby certify their participation in and agreement with the Kenai Peninsula Caribou Management Plan.

The Alaska Department of Fish and Game acknowledges its participation in the development of the Plan, and agrees that all aspects of the Plan are consistent with management of the Kenai Peninsula's caribou herds under the sustained yield principle.

Wayne L. Regelin — 12/14/94

Director, Division of Wildlife Conservation — Date

The U.S. Fish and Wildlife Service acknowledges its participation in the development of the Plan, and agrees that all aspects of the Plan are consistent with Service policies and purposes of the Kenai National Wildlife Refuge to "... conserve fish and wildlife populations and habitats in their natural diversity...".

Acting Regional Director, U.S. Fish and Wildlife Service — 11/28/94

Date

The U.S. Forest Service acknowledges its participation in the development of the Plan, and agrees that all aspects of the Plan are consistent with Service policies and purposes of the Chugach National Forest.

for Forest Supervisor, U.S. Forest Service — 4/20/95

Date

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APPENDIX

FLIGHT.DBF

KENAI NATIONAL WILDLIFE REFUGE
TELEMETRY FLIGHT FORM

F:\BIO\CAR\CARFORM

Flight #:_____ Date:____/____/____ Study Area:_____ Species: CARIBOU Aircraft:_____
Pilot:_____ Observer(s):_____ Start Time:_____ Stop Time:_____
Wind Speed:_____ Wind Direction:_____ Precip:_____ Temperature:____°F Turbulence:_____ Cloud Cover:_____
Light Type a) bright:_____ b) flat:_____ Light Intensity a) high:_____ b) medium:_____ c) low:_____
Snow Age a) fresh:____ b)moderate:____ c)old:____ Snow Condition a)complete:____ b)veg showing:____ c)bare:____

Remarks:_____

ANIMAL.DBF

[active radio collar frequencies listed here]

Obs	Radio	Composition								UTM Coordinates		Location				Photos		
Num	Freq	Total	Male	Fema	Youn	Yrlg	Uncl	Elev	Habitat	Easting	Northing	Quad Name	Twn	Rng	Sec	Roll	Exp	Remarks
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2																		
3																		
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JULY 1993